C 41461

Name..........................................

Reg. No...............................

# FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2013

## (CCSS)

### Physics

### PH4 C07—ELECTRICITY, MAGNETISM AND NUCLEAR PHYSICS

Time : Three Hours                                                    Maximum : 30 Weightage

## Section I

*Answer **all** questions.*
*Each question carries ¼ weightage.*

1. Two charges are placed at a fixed distance apart. If a glass slab is placed between them, the force will :

    (a) Increase.                          (b) Decrease.

    (c) Remains the same.            (d) Become zero.

2. An electric charge in uniform motion produces :

    (a) An electric field.              (b) An magnetic field.

    (c) Both electric and magnetic field.    (d) Neither electric nor magnetic field.

3. The potential inside a hollow spherical conductor :

    (a) Is a constant.

    (b) Varies inversely as the distance from the centre.

    (c) Varies directly as the distance from the centre.

    (d) Varies inversely as the square of the distance from the centre.

4. The capacity of a parallel plate condenser is C. Its capacity when the separation between the plates is halved will be :

    (a) 4C.                                (b) 2C.

    (c) $\dfrac{C}{2}$.                    (d) $\dfrac{C}{4}$.

5. The sensitivity of moving coil galvanometer depends on :

    (a) The angle of deflection.        (b) Earth's magnetic field.

    (c) Torsional constant of spring.   (d) Moment of inertia of the coil.

**Turn over**

6. The coil of a tangent galvanometer is put in the magnetic meridian to :

    (a)  Avoid the magnetic effect of the earth field.

    (b)  Produce intense magnetic field at the centre of the coil.

    (c)  Avoid error due to parallax.

    (d)  Produce a field at right angls to the earth's field.

7. A potentiometer is an ideal instrument for measuring e.m.f. because :

    (a)  It has a long wire.                    (b)  It does not disturb the p.d. if measures.

    (c)  It has a sensitive galvanometer.        (d)  None of the above.

8. The magnetic field at which superconductivity variables is called ————.

9. The density '$d$' of nuclear matter varies with nucleon number A as :

    (a)  $d \alpha A^3$.                          (b)  $d \alpha A^2$.

    (c)  $d \alpha A$.                            (d)  $d \alpha A^0$.

10. Which one of the following will penetrate in a thin glass slab ?

    (a)  $\alpha$-rays.                           (b)  $\beta$-rays.

    (c)  $\gamma$-rays                            (d)  Cathode rays.

11. A good modulator should :

    (a)  Not be a gas only.                       (b)  Not have appetite for neutrons only.

    (c)  Be light in mass number only.            (d)  Be all the above.

12. The field that binds the quarks is :

    (a)  Electric field.                          (b)  Colour field.

    (c)  Magnetic field.                          (d)  Gravitational field.

(12 × ¼ = 3 weightage)

## Section II

*Answer all questions.*
*Each question carries a weight of 1.*

13. Define electric field intensity at a point.

14. What is an equipotential surface ? Mention one property.

15. How does the drift velocity of an electron in a metallic conductor vary with increase in temperature ?

16. Why is diamagnetism almost independent of temperature.

17. Why are manganin wires preferred for the manufacture of standard resistances ?

18. How is a deflection magnetometer set in the tan B position ?

19. What is the principle of working of a nuclear bomb ?

20. What are nuclear forces ? Give its characteristics.

21. What are Leptons ?

(9 × 1 = 9 weightage)

## Section III

*Answer any* **five** *questions.*
*Each question carries a weight of 2.*

22. A parallel plate capacitor of area 2 m.$^2$ with a dielectric constant 7 is charged to a potential of 100 V. If the plate separation is $1 \times 10^{-4}$ m., calculate the capacitance and the energy stored in the capacitor.

23. An ammeter and a resistance 1090 $\Omega$ are connected in series with 110 V mains. The ammeter reads 9.1 A. What is its resistance ? A voltmeter is connected across the terminals of the 1090 $\Omega$ resistance. What voltage will it record ?

24. What is a Carey Fosters bridge ? Where is it used ?

25. Define the magnetic elements.

26. If 10 % of a radioactive element decays in 5 days, calculate the amount of the element left after 20 days.

27. Explain the phenomenon of carbon dating.

28. Briefly explain the theory of the origin of the universe.

$(5 \times 2 = 10$ weightage)

## Section IV

*Answer any* **two** *questions.*
*Each question carries a weight of 4.*

29. Explain the principle and working of a potentiometer. Describe an experiment to determine the resistance of a wire using potentiometer.

30. Give a law of disintegration of a radioactive substance. Derive an expression for the half-life of a radioactive element.

31. Explain the principle and working of a cyclotron. An electron beam entering a uniform magnetic field of intensity 1.4 Weber/m.$^2$ is deflected along a path of radius of curvature $10^{-6}$ m. Calculate the velocity of the electron.

$(2 \times 4 = 8$ weightage)